

EMCAL Test Beam Plans

Craig Woody

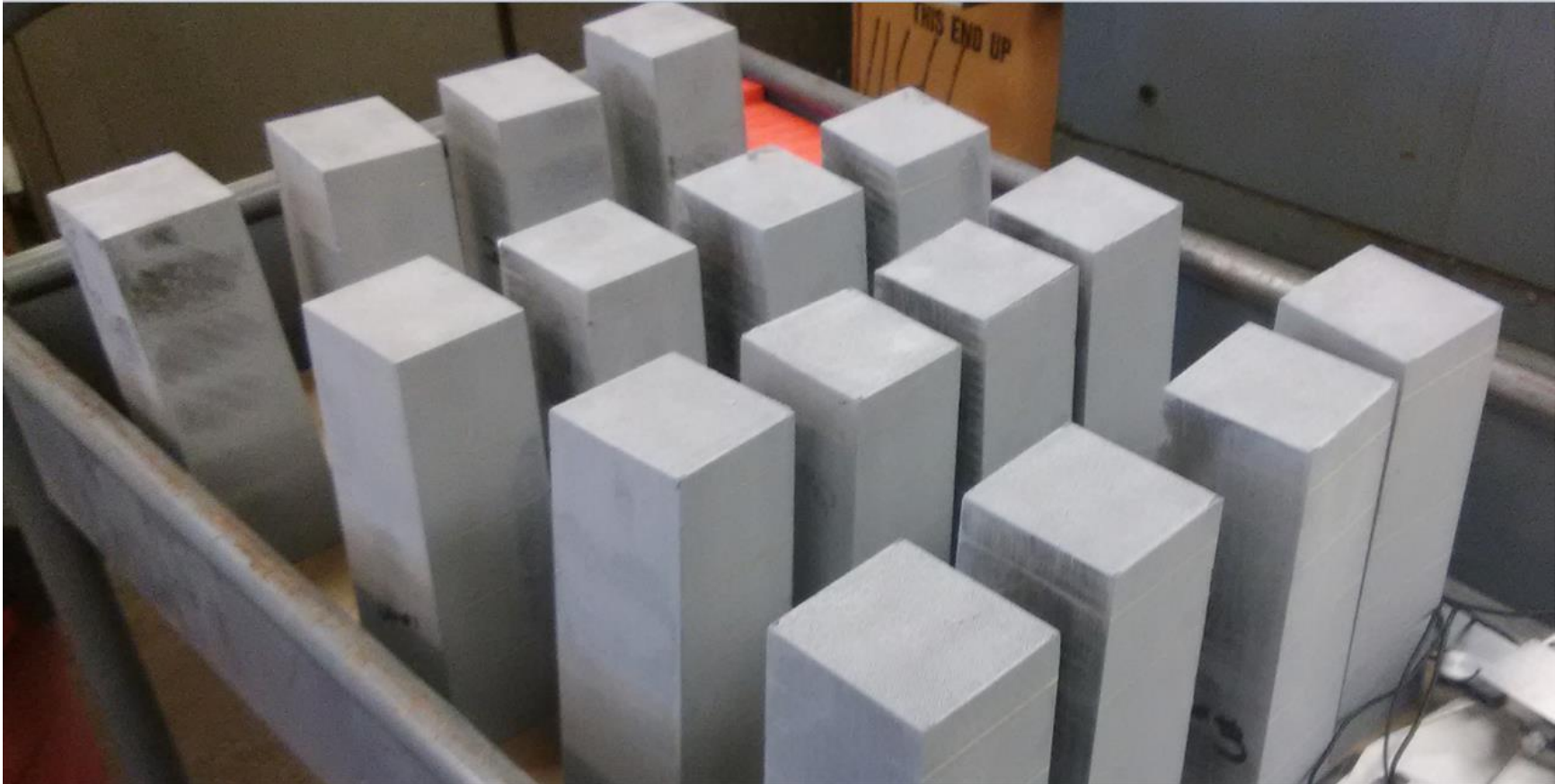
EMCAL Meeting

November 22, 2016

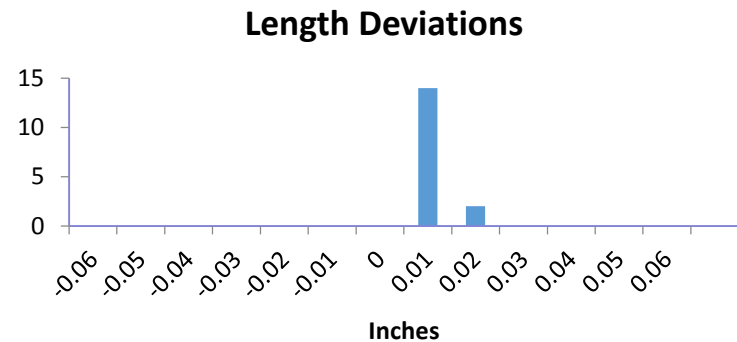
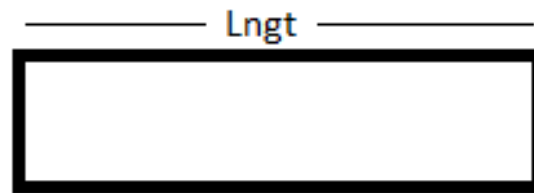
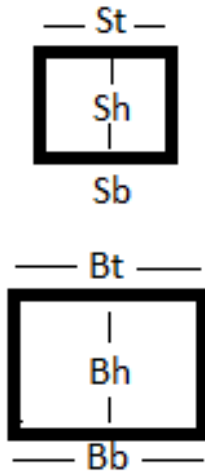
Goals of the Beam Test

1. Demonstrate that we can produce 2D projective modules
2. Further develop the electronic and mechanical design for building a full sector of 2D projective modules
3. Measure the performance of the 2D projective modules
 - Energy resolution and position dependence of the resolution with two different types of light guides.
Note: Neither of these light guides are practical for the final detector but these measurements will hopefully demonstrate that longer light guides will allow us to achieve our goal of $15\%/\sqrt{E}$ energy resolution.
 - Non-uniformity due to module geometry at large η
 - Energy linearity
 - Energy resolution in combination with the HCAL
 - e/p π in combination with the HCAL
4. Test new LED and calibration system
5. Test new readout electronics
6. Do additional position scans of 1D projective prototype

UIUC modules have arrived at BNL !

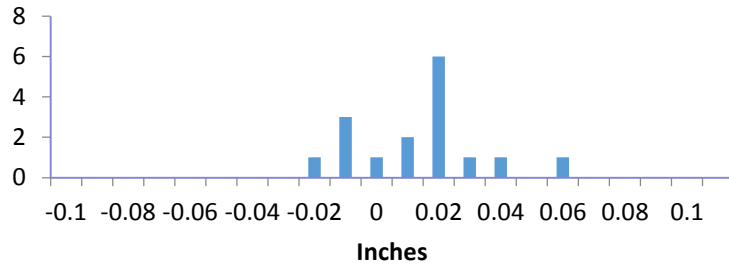


Dimensional data on the 16 modules (From Eric)

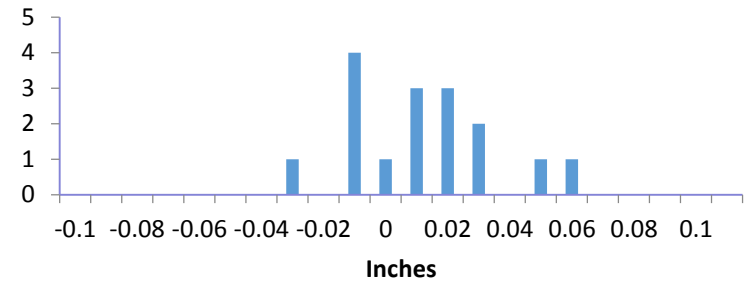


Deviations on transverse dimensions

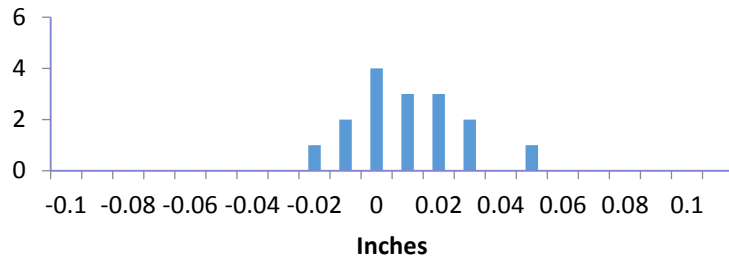
St Deviations



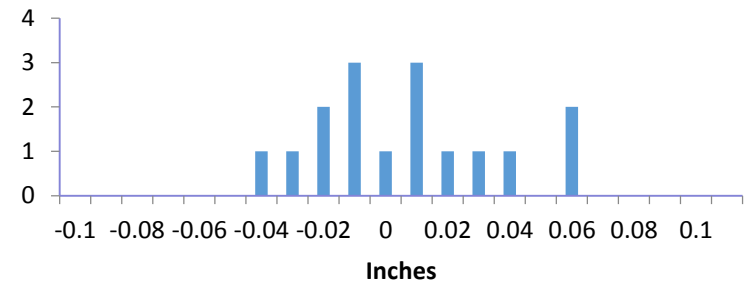
Bt Deviations



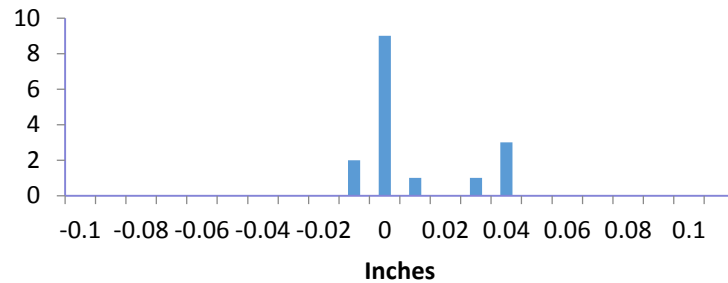
Sb Deviations



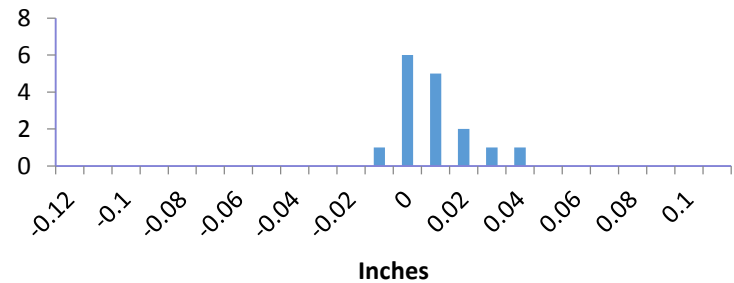
Bb Deviations



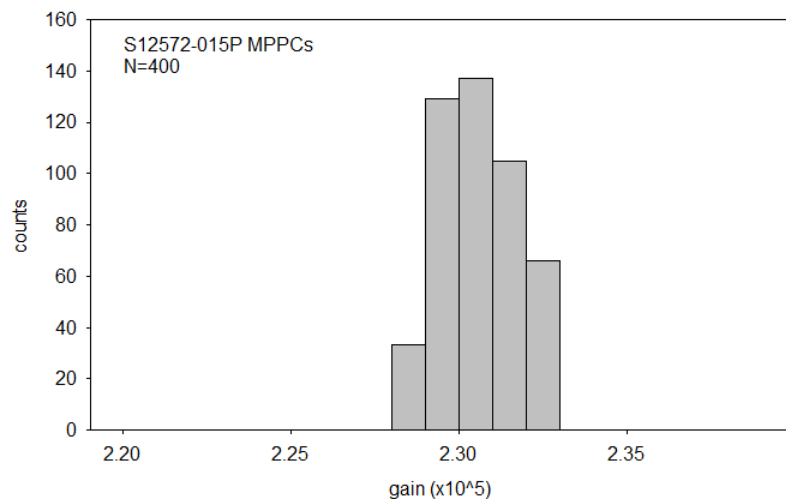
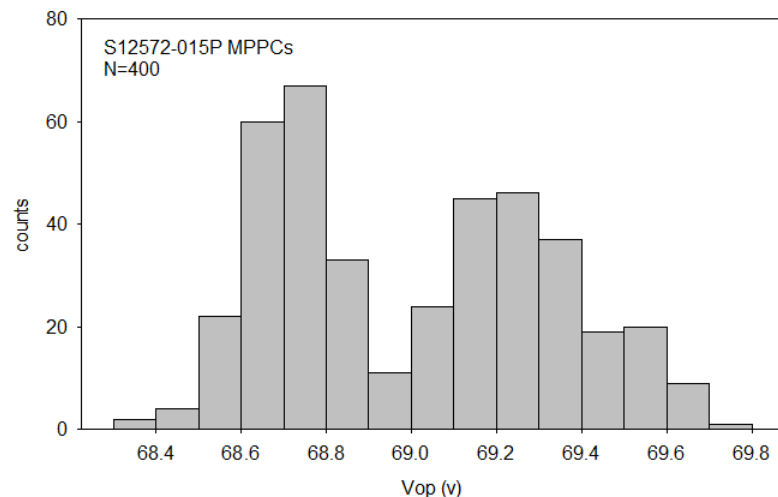
Sh Deviations



Bh Deviations

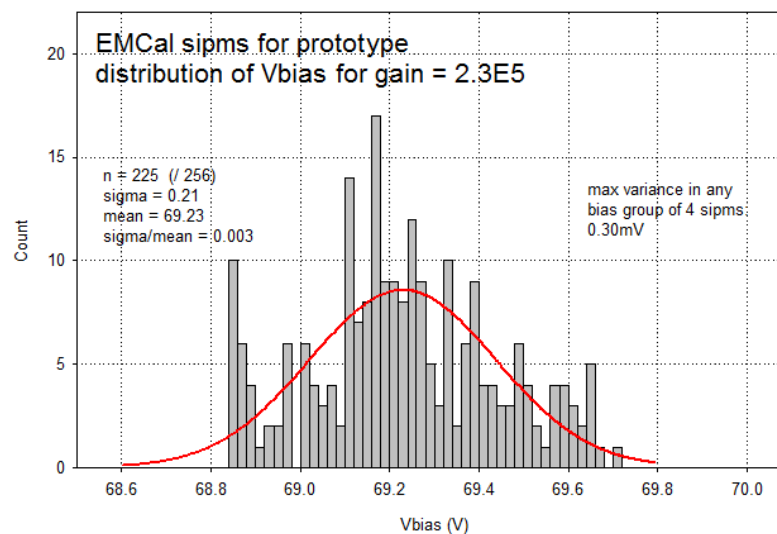


SiPMs for EMCAL Prototype



EMCAL 256
HCal: 160
Total: 416 (+ spares)

400 received to date
200 more due in early December

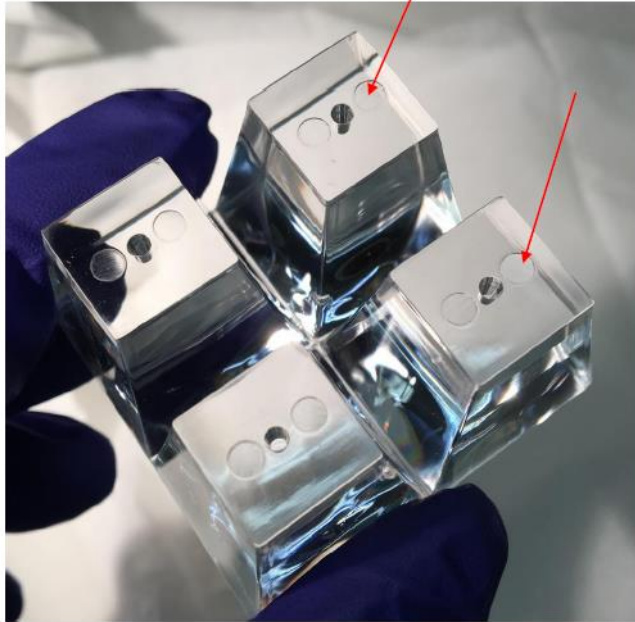


S. Stoll

Light guides

We will use 8 injection molded quad 1" light guides on 8 of the prototype modules

Markings from mold:



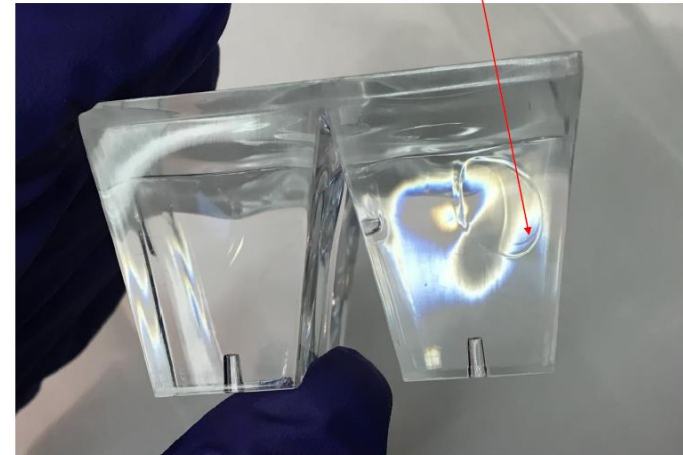
100 pieces produced (~ \$3 ea)

Not bad, but there are many imperfections.

Some can be machined away, others cannot

Overall yield ~ 20%

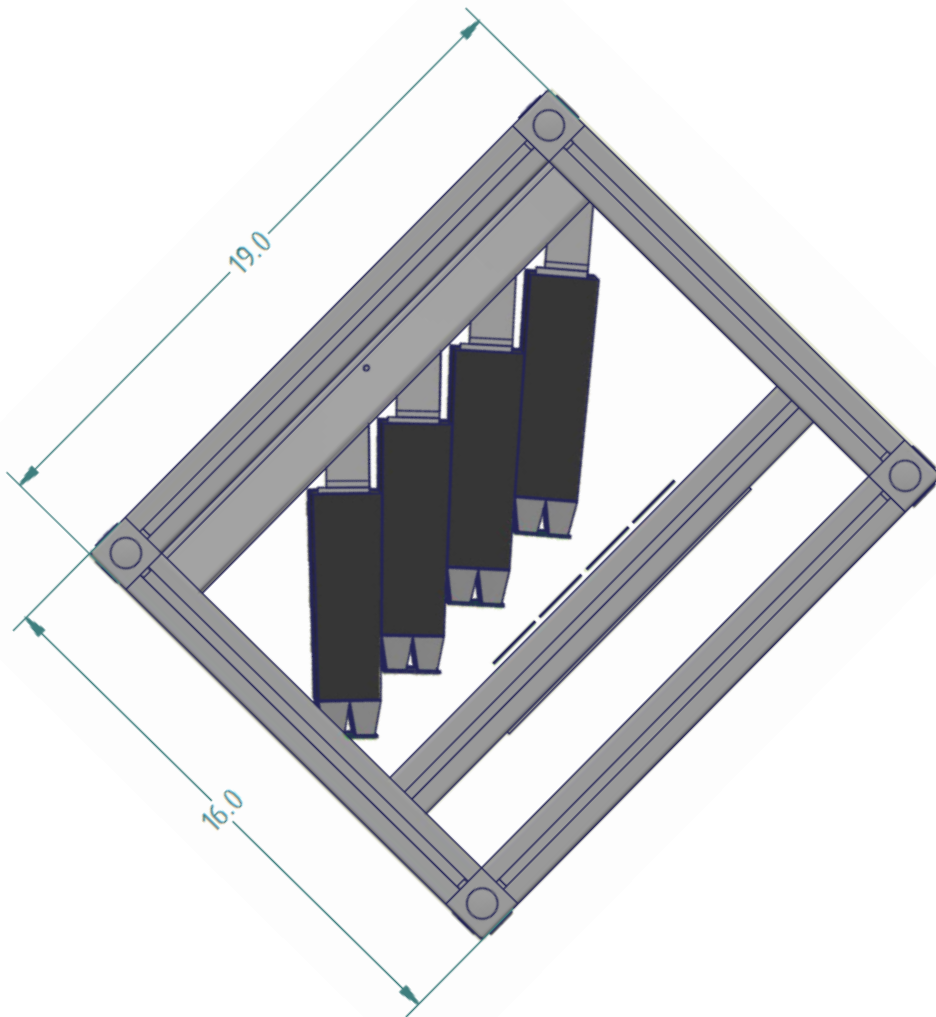
Fused filament



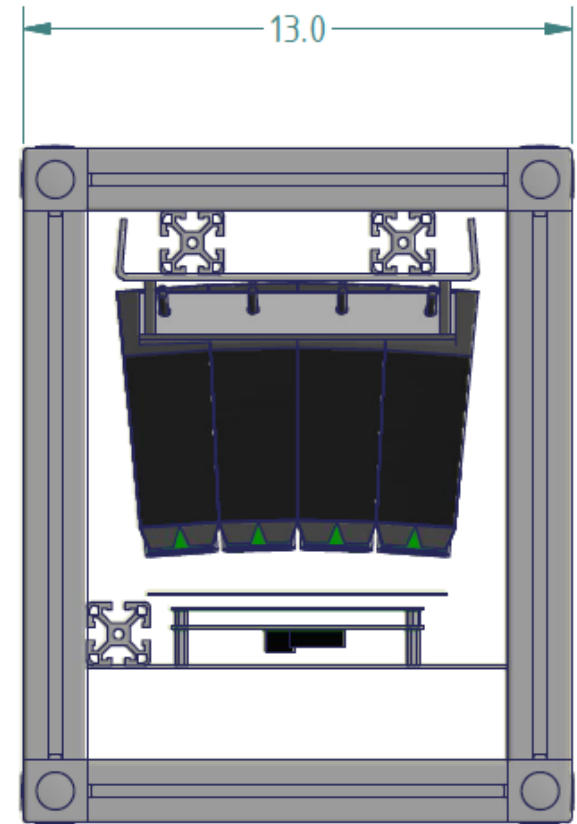
Top: ejection marks

40 individual 2" light guides (of which we need 32) are being fabricated in the Stony Brook shop and will hopefully be ready by mid December and will be installed on the other 8 modules

2D Prototype Frame



↑ Beam

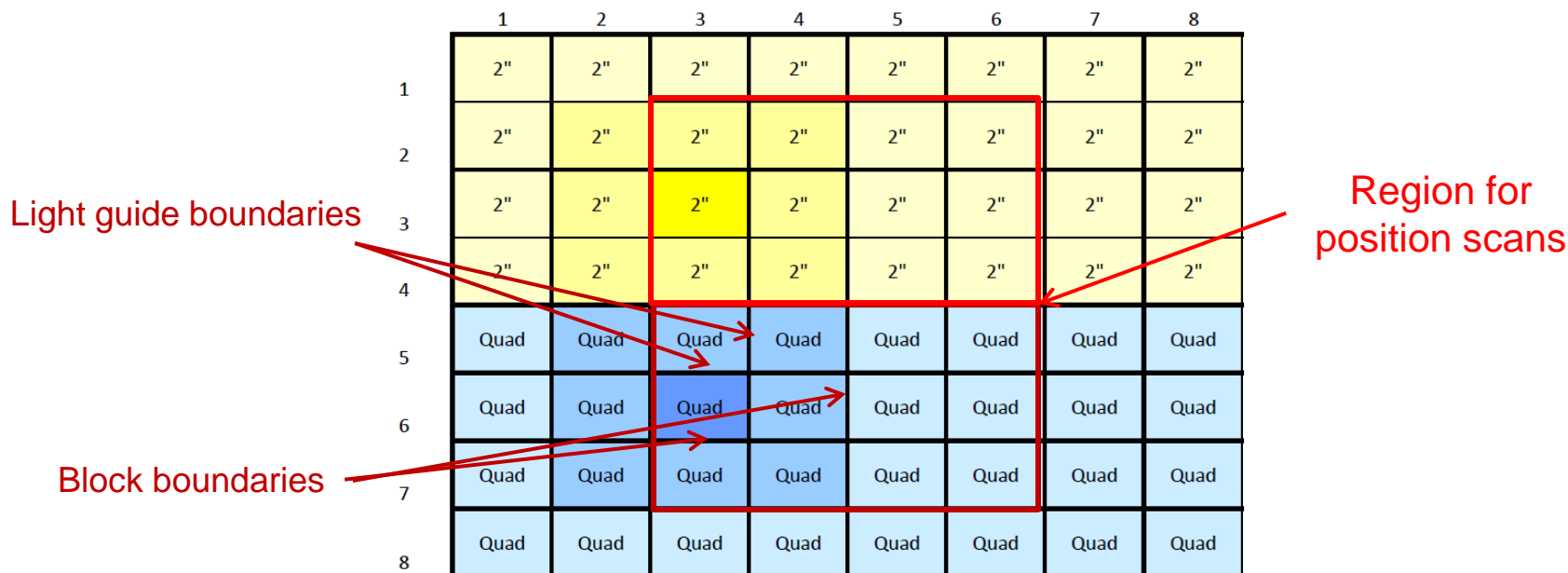


R. Ruggerio

Energy and Position Scans

Standalone

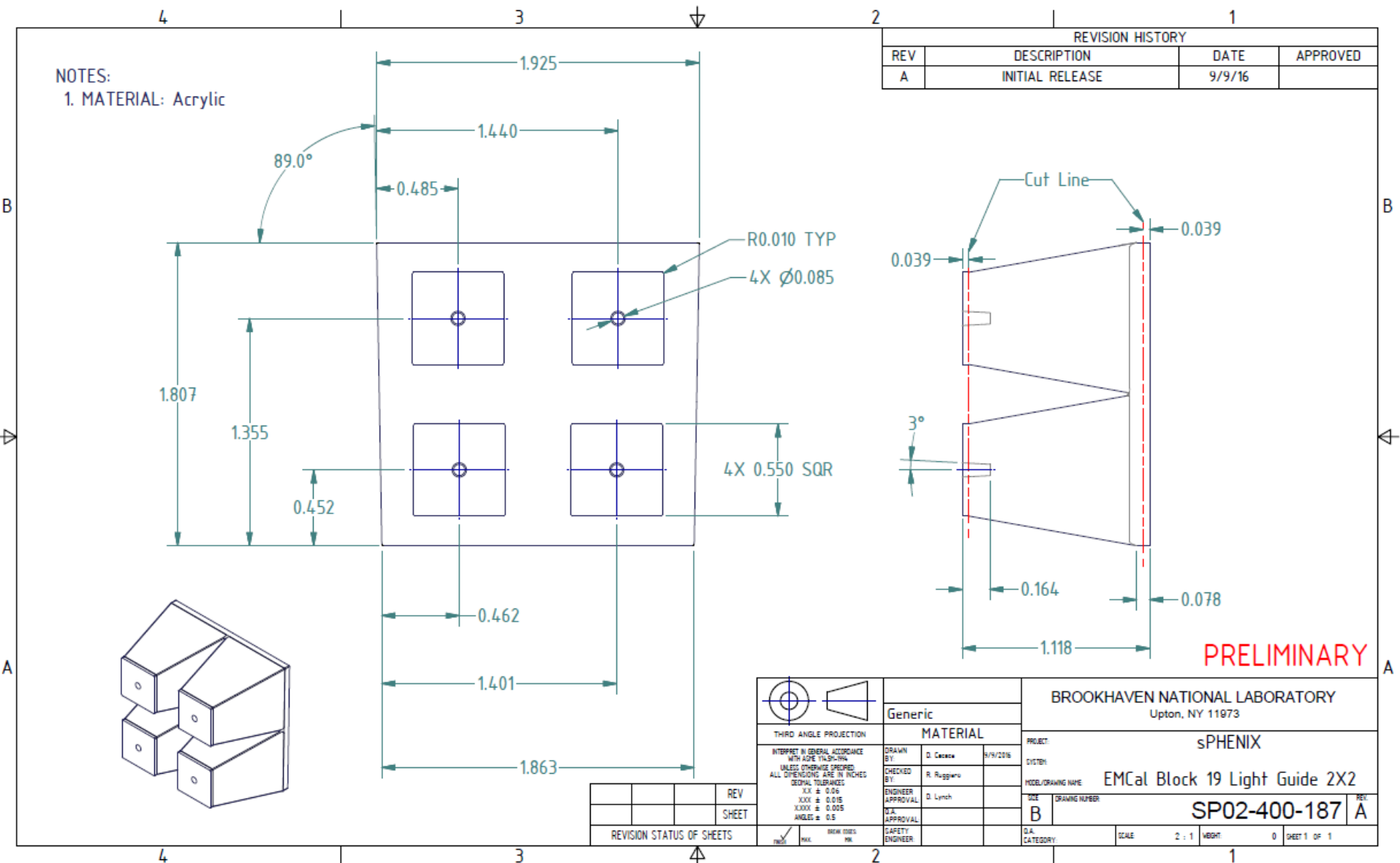
- ❑ MIP Calibrations (0° w.r.t. incoming beam - 64 runs)
 - Need to move ~ 20 cm in X and Y
- ❑ Energy scans in central tower (10° w.r.t. incoming beam)
 - $\pm 1, \pm 2, \pm 4, \pm 8, \pm 12, \pm 16, \pm 20, \pm 24$ GeV/c
- ❑ Horizontal position and vertical position scans over light guide boundaries and block boundaries (probably at 4 and/or 8 GeV)
 - Needs to translate in X ~ 10 cm, Y ~ 15 cm



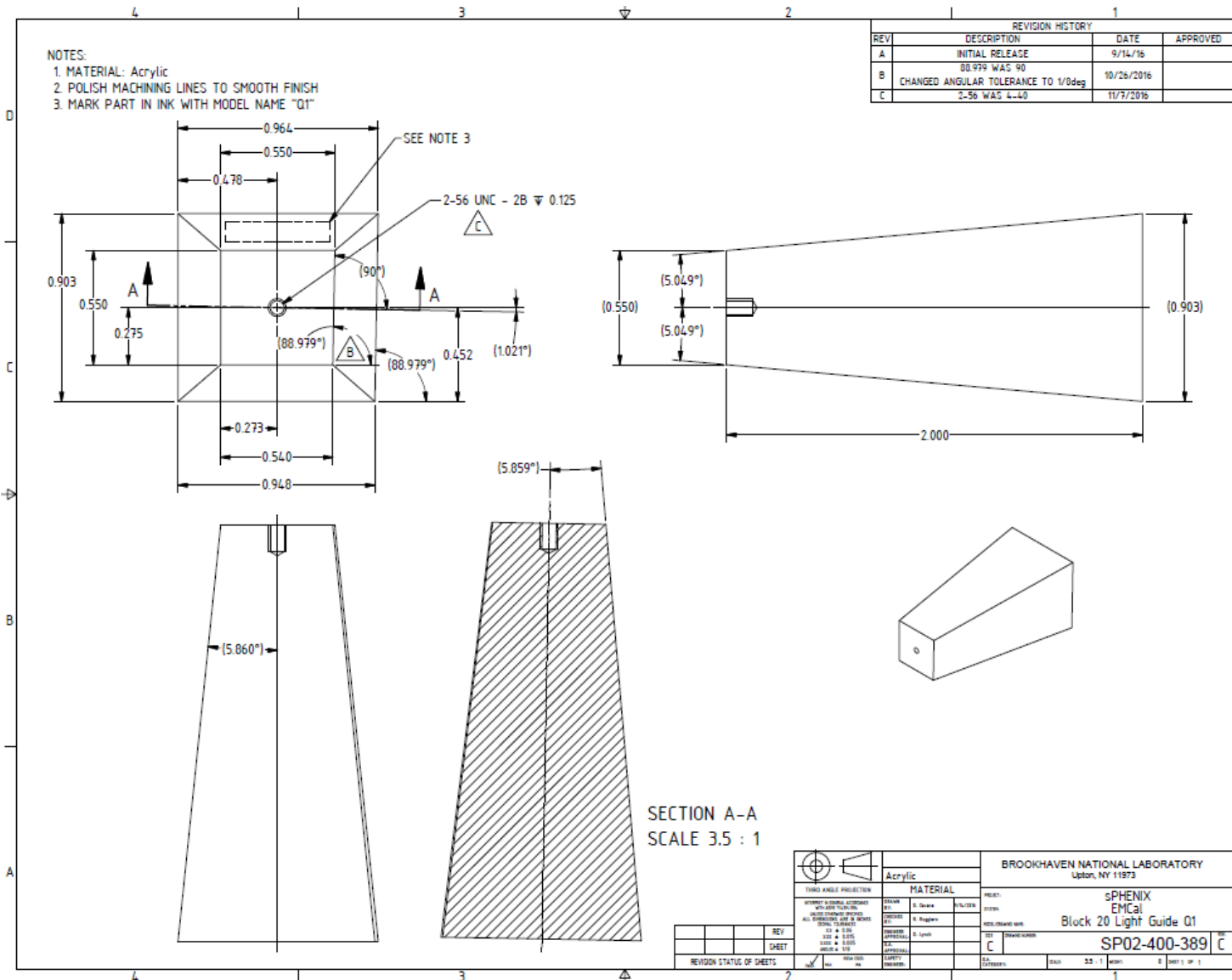
Combined running with HCAL will be done in a fixed position

Backup

Quad 1" Light guides



2" Long Individual Light Guides



2x longer (2")
individually
machined light
guides being
made in the
Stony Brook
Machine Shop

Will put these
on the other
half of the
calorimeter

Test Beam Plans

Week 2

- Jan 25-Feb 1 EMCAL studies upstream
 - High statistics position scans
 - Normal and half gain bias
 - Repeated PbGI measurements during scans
 - PbGI measurement with new digitizers
 - Rotation of calorimeter 5°, 10°, 20° (beam-fiber)
- Goal
 - Calibrated energy resolution in EMCAL 1 and EMCAL 2
 - Comparison with T-1044-2016a

J. Haggerty

HCAL Workfest
10/22/16